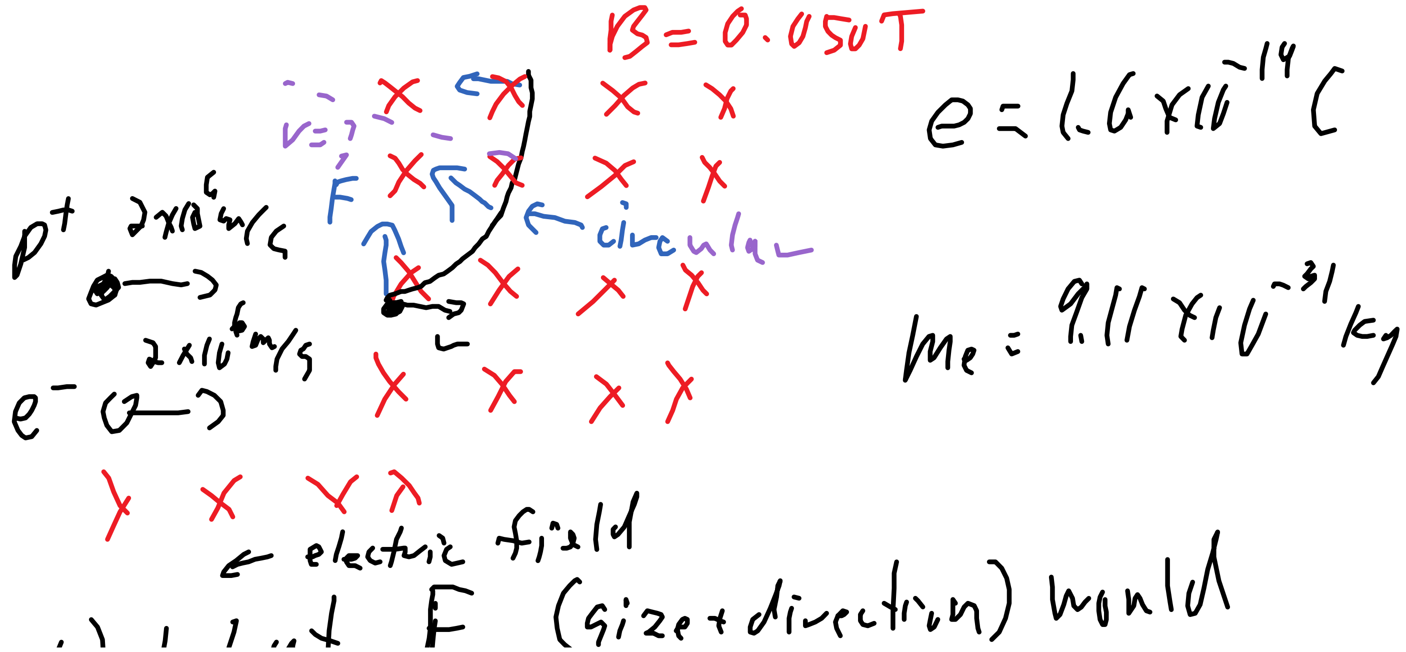
An electron and proton moving at 2.0 x 10^6m/s enter a magnetic field as shown in diagram below. If the magnetic field strength is 0.050T, draw the path of each particle from entering the field until it exits.



allow the particles to go straight through the B-field?

c) how would your answer to a change if the particles had a v component into the page as well as sideways?

$$F_c = F_B$$

$$\frac{mv^{2}}{r} = qvB$$

$$r = \frac{mv}{qB} = \frac{(9.11\times10^{-31})(2\times10}{1.6\times10^{-19}C \quad 0.050}$$

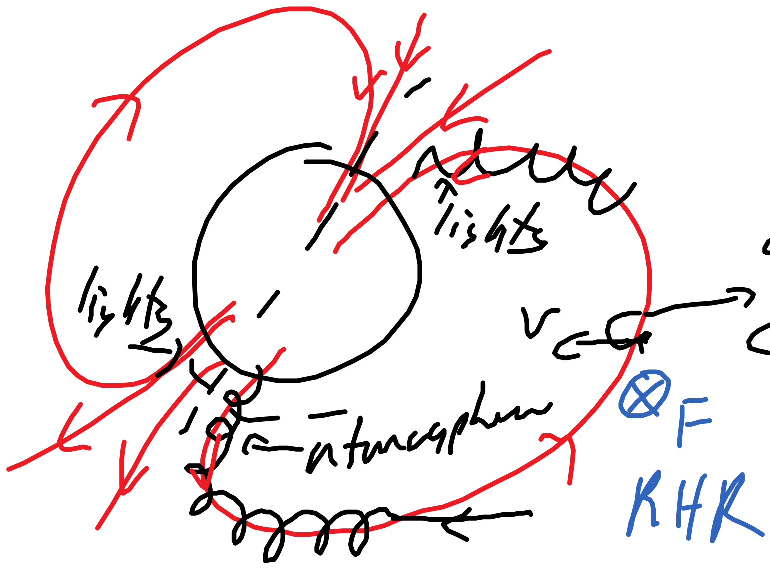
1.67×10^{-27} kg

$r = 0.42$ m (proton), 2.3×10^{-4} m (electron)

b) if the electric field is down, it will push the proton down and the electron up.

It will balance the magnetic force if
$F_e = F_B$
$qE = qvB$
$E = vB = 2.0 \times 10^6 m/s \times 0.050\ N/Am = 1.0 \times 10^5 N/C$
This is sometimes called a velocity selector, because only particles with a velocity of $v=E/B$ go straight through. This is how early mass spectroscopy (measuring mass) was done.

c) Look at the Earth's Magnetic field and cosmic rays:

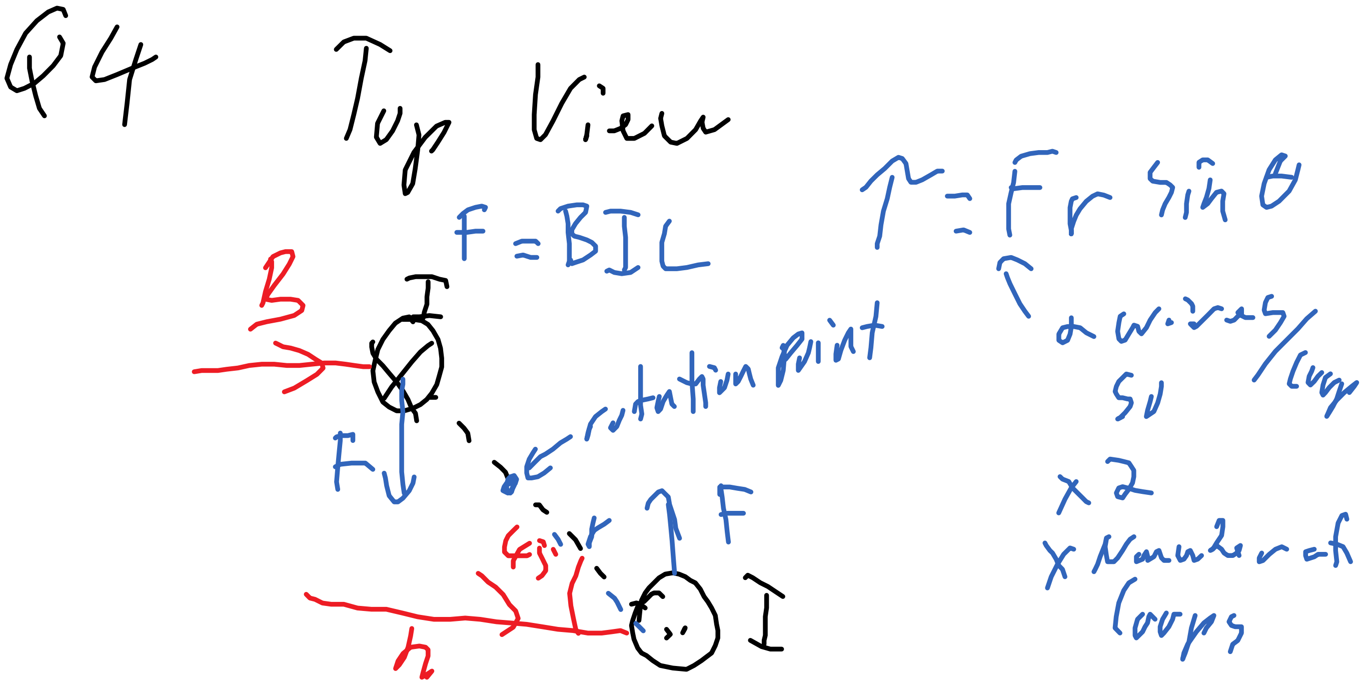


some cosmic rays get deflected by The Earth's Magnetic field

↑ charged particles move in circular path along the magnetic field lines
- spiral to the poles
- hit the atmosphere + create Northern Lights, Aurora Borealis

https://www.google.ca/search?q=northern+lights+images&safe=strict&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj1uNOL7ODTAhUL6mMKHUDEAJgQ_AUICigB&biw=1280&bih=894

Practice Test:



2r = W

BILNWsinθ =

0.05x0.02x0.06x80x0.06xSin(45)=

0.000203646752981726

2.0×10^{-4} Nm of Torque, counterclockwise

Northern Lights Vancouver: